

ABSTRACT

THESIS: The Efficacy of a Combined Risk Factor & Quantitative Ultrasound Osteoporosis Screening Tool

STUDENT: Micaela A. Kruckenberg

DEGREE: Master of Science

COLLEGE: Applied Science and Technology

DATE: May 2009

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Purpose: The primary purpose of this research study was to cross-validate the risk factors in the Osteoporosis Risk Assessment by Composite Linear Estimate [ORACLE] as a screening tool in a population of healthy U.S. women at various menopausal stages. The secondary purpose of this study was to evaluate the potential use of physical activity history and relevant osteoporosis risk factors to effectively determine current bone status for a mixed menopausal population. Third, the purpose of this study was to compare Omnisense quantitative ultrasound [QUS] and dual-energy x-ray absorptiometry [DXA] diagnostic values of osteopenia/osteoporosis based upon T- and Z-scores. **Methods:** Fifty-six female subjects (46.1 ± 6.3 years) in pre-, peri-, and post-menopausal stages who volunteered to participate in this study. Subjects completed an osteoporosis risk factor and physical activity history questionnaire. Subjects underwent laboratory testing comprised of distal radius quantitative ultrasound scan, dual hip and spine DXA scans, and a one week physical activity assessment. **Results:** Logistic regression analysis was utilized to examine the ability of the ORACLE to predict low BMD at the femoral neck and lumbar spine. There were no significant relationships

between the group of ORACLE variables and BMD status at either the femoral neck or lumbar spine. In addition, none of the individual variables (age, BMI, use of HRT therapy, previous fracture, speed of sound [SOS]) were found to be significant predictors of low BMD at the femoral neck or lumbar spine. Notably, SOS measures from the Omnisense QUS were not found to have a strong positive predictive ability, with sensitivity values between 0-20% and specificity values between 81-86% at the femoral neck and lumbar spine. When the cohort was divided into normal and overweight/obese groups, sensitivity and specificity of QUS measures was not improved in the normal BMI group compared to the overweight/obese group. The use of physical activity variables to predict low BMD revealed some relationships trending toward significance, supporting previous research. Linear regression analyses revealed that the individual accelerometry variable of moderate-vigorous non-bout activity counts at the lumbar spine approached significance as a predictor of low BMD ($p = 0.081$). A significant correlation ($r = 0.31$, $p < 0.05$) between steps/day and subjective measures of current weight-bearing activity support the validity of the physical activity recall method for current physical activity.

Conclusions: This study found that the ORACLE risk factors were not a valid osteoporosis screening tool in a mixed menopausal population of U.S. women. Secondly, subjective and objective physical activity measures were non-significant predictors of current low BMD, but greater levels of moderate to vigorous non-bout activity counts trend towards being a significant predictor of higher BMD at the lumbar spine. Finally, results showed that Omnisense QUS measures were not found to be significantly related to DXA measures. **Key Words:** bone mineral density, dual-energy x-ray absorptiometry, osteoporosis, physical activity, quantitative ultrasound